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# THE DENTAL PRACTITIONER

*monthly journal for the Practitioner and his Staff*

VOL. I, NO. 2 OCTOBER, 1950

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# THE DENTAL PRACTITIONER

*A Monthly Journal for the Practitioner and his Staff*

*Editor :* JOHN E. SEEAR, L.D.S., R.C.S.

*Associate Editors :*

H. MANDIWALL, M.B., B.S., L.D.S.

N. LIVINGSTONE WARD, L.D.S., D.D.S.



VOL. I, No. 2


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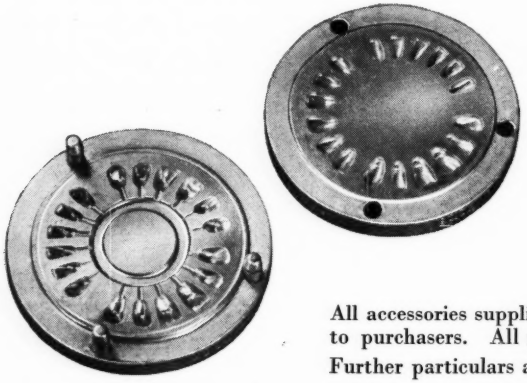

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# THE DENTAL PRACTITIONER

*A Monthly Journal for the Practitioner and his Staff*

Vol. I, No. 2 October, 1950

*ITORIAL*

## IT'S IMPOSSIBLE!

YES, it must be; all our readers surely can't feel that our first number was perfect! In our humble opinion such a state of affairs can never exist and yet we have had numerous letters and not one complaint. To the many who have written congratulating us, "thank you most sincerely". Our principal aim is to produce a magazine that will meet with your approval, so please let us have your criticisms, which we hope will be as constructive as possible.

This month our gratitude goes forth to our colleagues on the staff of the Dental School at Sheffield, who have contributed such excellent articles, case histories, etc. On behalf of us all, "Thank you, Sheffield!"

The Chart in this issue is the first of a series on Partial Denture Construction; these will alternate with the coloured charts, the first of which you have already received in the September number.

A final word—or rather a reiteration of our earlier appeal—the success of this journal depends even more on the co-operation of the dental practitioner than on the enthusiasm of the Editor and publishers; therefore let us have your complaints as well as bouquets —and, even more, we want articles, case histories, interesting X-rays, illustrated hints, in fact, just anything which will interest and help your colleagues in dentistry.

### PREVIEW

No. 3 NOVEMBER

A Clinical Investigation in Preventive Dentistry — *John Miller, B.D.S. (Manchester)*

The Jacket Crown — *J. K. Holt, M.Sc., F.D.S.R.C.S.*

A Pulp Conservation Case with Some Unusual Features — *Charles Dillon, D.D.S., L.D.S.*

Refractories — *Ernest A. Schoolden*

Illustrated Hints — Book Reviews

Society Notes — Abstracts

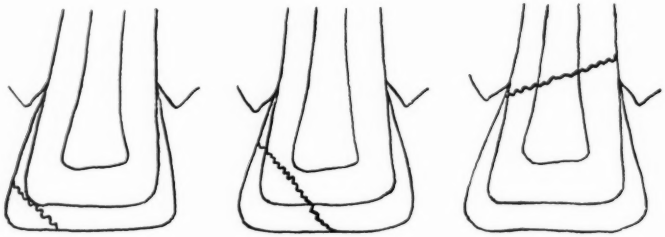
COLOURED CHART No. 2

# FRACTURED ANTERIOR TEETH

By **E. L. HAMPSON**, B.D.S., H.D.D. (Edin.), F.D.S. (Eng.).

*Lecturer in Operative Dentistry, University of Sheffield*

A GOOD deal of research which is being done in dentistry to-day is in the field of prevention. The relationship between sugar consumption, fluorine, and dental caries is being investigated in most research centres in the world. Eventually an effective way of preventing caries may be found. However, no prophylactic measures will prevent accidents to the teeth by direct trauma. Chas. A. Sweet (1942) pointed out the increased incidence of fractured anterior permanent teeth in the modern generation. This he attributes to the "probable result of lack of development of the upper lip because of the following conditions: (1) The bad habit of mouth breathing; (2) Mouth breathing due to congestion of the mucous membrane of the nasal cavity; (3) Closed *bite* with or without inferior retrusion, which causes protrusion of the upper anterior teeth." Sweet goes on to point out that: "(1) More than 90 per cent of all fractured anterior teeth are in the upper jaw, and (2) More than 90 per cent of all fractured anterior teeth protrude and do not have lip coverage." It is suggested by Sweet that more attention should be paid to the treatment of abnormalities of occlusion so that the number of accidents to the upper front teeth may be reduced. Many operators do not seem to realize the seriousness of traumatic damage to the anterior teeth and frequently refuse to attempt conservative treatment and insist on extraction. It must be strongly emphasized that with systematic treatment a good result can be obtained. The teeth can be restored to nearly normal function and appearance without resorting to the fitting of dentures or attempting to construct bridges—which are difficult if the patient happens to be a child. F. R. Adams's (1944) statement, "To subject a young child to wearing dentures is unthinkable provided it can be prevented", will be agreed with by most dental surgeons.



*Figs.* 1–3.—Diagrams showing varieties of fracture (*see* text).

The classification of the degrees of injury to the teeth by trauma employed by the writer is as follows:—

1. Teeth which have been damaged, but with no break in the dental hard tissues.

2. Fractures in which only a small section of enamel is lost and a good section of dentine remains between the fractured surface and the pulp (*Fig.* 1).

3. Fractures in which the pulp is still intact but shows "red" through the remaining dentine (*Fig.* 2).

4. Fractures in which the pulp is exposed.

*a*. Of less than 24 hours' duration.

*b*. Of more than 24 hours' duration and probably heavily infected.

5. Fractures involving the pulp chamber in teeth with dead pulps.

6. Fractures with the fracture line partly in the gingival sulcus and partly in the anatomical root (*Fig.* 3).

7. Fractures with the fracture line below the gingival sulcus and near the neck of the tooth.

8. Fractures with the fracture line across the apical third of the root.

Before considering the diagnosis and treatment it is as well briefly to review the pathological changes which are likely to occur. The structures involved are the periodontal membrane, the pulp, and the alveolar bone. Traumatic injury to teeth not exposing the pulp differs from injury by caries in that it does not become infected unless from the blood-stream. The periodontal membrane with its tactile and buffering function is the first dental tissue to react. Hyperæmia, acute inflammation, or suppuration is likely to occur. Where the trauma is slight, inflammatory changes will soon resolve if the cause is quickly removed. If, however, the trauma persists, the pulp will be involved and congestion may cause thrombosis and death of the pulp. Infection does not always follow death of the pulp. A dry gangrene occurs if the cutting off of the blood-supply has been preceded by a gradually increasing arterial obstruction. In the more violent injuries a sudden cessation of the blood-supply may bring about a moist gangrene. Later on, bacteria may invade the pulp through caries or from the blood-stream. It must be realized that once the pulp has died, in those cases where the apices of teeth are open, root formation ceases. Unless the root canal is properly treated osteoclastic activity may destroy a large part of the root which has already been formed.

For a proper diagnosis and treatment of external injuries to the teeth the case in hand must be placed in the correct group of the classification and a systematic examination carried out. First, a history is obtained from the patient or the parent and then a clinical examination, including simple percussion, observing colour changes, the degree of looseness, and also the relative lengths of the crowns of the teeth involved, is made. The vitality of the teeth is estimated by either thermal or electrical means and a good radiographic examination must always be made. This must never be omitted because any tears or fractures of the root and damage to the alveolar process must be seen. In those cases where the teeth involved are already pulpless, a knowledge of the condition of the apical region is essential for adequate treatment and to assess the degree of success to be expected. The tissues of the lip and tongue must also be examined in case fragments of tooth substance have entered.

The treatment of young fractured teeth falls into three stages: (1) The immediate treatment to relieve pain and to protect important structures; (2) The temporary restoration of the teeth; (3) Years later, more permanent restoration. The temporary restoration is usually done about two weeks after the accident and the permanent treatment carried out any time after the age of 18 years. Patients, especially if they are children, are usually very distressed when they first appear after suffering damage to their front teeth. Everything must be done to gain the patient's confidence and to put him or her at ease. Sedatives are sometimes useful, phenobarbitone being the drug favoured by many. After the preliminary examination has been made and X-rays have been taken, the immediate treatment is carried out. If the pulp was alive before the accident occurred everything must be done to preserve its vitality. Death of the pulp often occurs in those cases where no apparent damage has been done to the hard tooth substance. Frequently professional advice and treatment is not thought necessary

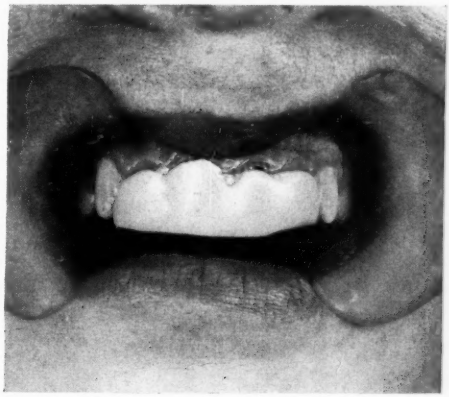


*Fig.* 4.—Acrylic resin splint to stabilize the teeth.

by the parent and if the teeth become gradually tightened it is believed that the condition has disappeared spontaneously. On many occasions, however, the parents are very alarmed some four to six weeks later when an "acute flare-up" due to death of the pulp takes place. Other changes of a more chronic nature which may take place in the pulp are fibrous, reticular, or calcareous degeneration. The normal colour of the tooth is often lost and is replaced by differing shades from light brown to bluish black. So as to avoid the complications mentioned, all cases should be treated. The teeth should be stabilized by means of acrylic resin splints (*Fig.* 4) or by a series of orthodontic bands joined together so that the continuous trauma of mastication is avoided until reparative changes have had time to take place. The child should be fed on a liquid diet for a few days. Sometimes the opposing teeth need to be ground or the bite raised by placing a temporary acrylic resin appliance on the posterior teeth. These measures are maintained until all soreness disappears. The stabilizing appliance is better constructed by the indirect method so as to avoid further irritation to the already inflamed tissues. Hydrocolloid impression materials are to be preferred because the firmer nature of the compositions makes them press too hard upon the teeth. Models are cast in Q.S. stonehard, which, after drying, are soaked for a few hours in a light liquid paraffin. Any of the temporary appliances can be made on these hard models. Cases which fall into the second group need stabilization plus the grinding of the rough edges of enamel to avoid irritation to the lips and tongue.

The treatment of the third group in which the pulp shows "red" through the dentine demands even more prompt and careful attention than of the groups so far discussed. Stabilization and relief from the forces of mastication are necessary, but the additional protection of the fractured surface must be attended to immediately. The very short distance from the external surface to the pulp renders it easy, especially in children's teeth, for bacteria to reach the pulp and set up the chain of events beginning with hyperæmia and acute inflammation and ending in suppuration. The writer favours a paste of zinc oxide and oil of cloves as the sedative protective dressing, whilst Adams (1944) suggests a Canada-balsam–calcium-phosphate mixture applied to the tooth surface, which has been varnished. Some means of maintaining the sedative in position must be employed and a celluloid crown form cut to the correct size has been found most convenient. This can be left in position for a few weeks until a more permanent restoration is prepared. If a celluloid crown form is not available an orthodontic band made of stainless steel is a good substitute. Better stabilization is obtained by fixing an acrylic resin splint upon the damaged tooth and one or two of its neighbours (*Fig.* 4). These splints can be quickly made from a stone model obtained from a hydrocolloid impression (Dentocoll or Zelex). Later on a modified shoulderless acrylic resin jacket crown (*Fig.* 9) can be fitted which will give a good æsthetic effect, until a more permanent restoration can be prepared. In all cases of external injury to the teeth the parent must be warned that because of the damage which must have been done to the apical vessels a good prognosis cannot be guaranteed and that an "acute flare-up" may occur in from four to six weeks. A better recovery is to be expected if the apex is wide open because of the greater blood-supply to the pulp and the larger amount of room to allow for any expansion of the tissues due to congestion of the vessels.

Two factors are very important if the pulp is exposed: The time which has elapsed between the accident and the patient reporting for treatment, and the patient's age, greatly influence the treatment. It is generally agreed that during the first twenty-four hours serious infection of an open wound may not occur, but that wounds which have not been treated for more than that period are likely to be grossly contaminated with bacteria. The tooth with the open apex lends itself to the more conservative measures such as pulp capping and partial pulpectomy. A partial explanation of this was given by Slack (1948), when he suggested that "If the pulp is partially

removed there is a traumatic inflammatory reaction and therefore expansion takes place and the vessels dilate. If a tooth with a developing apex is removed a soft cartilaginous-like developing organ is found attached to the apex. Within that little mass, expansion of blood-vessels can occur so that the pulp vessels will remain healthy, the blood-supply to the developing tooth will continue, and the tissue health remain normal." For the cases in which the pulp is exposed and not grossly infected the writer recommends pulp capping with a sterile paste made of calcium hydroxide and water if the exposure is small. If the exposure is large the operation of partial pulpectomy, well described by Slack, has been found very satisfactory by many. These procedures if successful will preserve the vitality of the pulp and thus enable the normal closing of the apex to take place. Minute details of the techniques will not be described here because they have been well described by Adams (1944), and Slack (1948).

If the apex of the damaged tooth has closed, or if longer than twenty-four hours has elapsed between the time of the accident and the patient reporting for treatment, it is a better practice to perform a total pulpectomy. Root-canal therapy if carried out under aseptic conditions gives good results and leaves a tooth which is both functional and not a source of infection to the rest of the body. These cases should be carefully watched and periodic radiographic examination carried out to detect any changes which may be taking place in the apical area of the root. Any sign of periapical infection should be regarded as an indication for the operation of apicectomy.

Those fractures which involve the root depend for their prognosis upon the position of the fracture line and the number of fractures. If the fracture is entirely below the bottom of the gingival crevice there is a good chance of healing by first intention. Here conditions are similar to a simple fracture of bone. Infection is absent and with adequate stabilization union of the two fragments will take place if the gap between them is not too great. Cases of union of fractures of the root have been recorded, the prognosis being good if the fracture line is well away from the neck of the tooth. Fractures through the roots of pulpless teeth have little chance of healing because of the inevitable infection of the area surrounding the ends of the fragments. Stabilization can be effected by using the appliances already mentioned, which are left in position for from four to six weeks, a portion of the crown always being left exposed so as to allow pulp tests to be carried out from time to time.

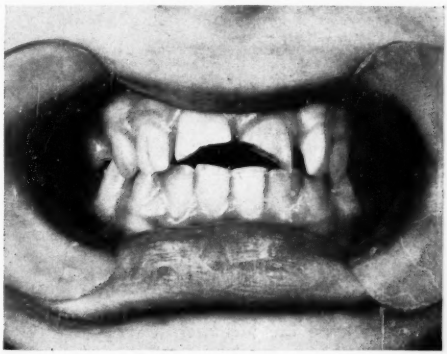


*Fig.* 5.—*Case* 1. Showing the fractured incisors.

## ILLUSTRATIVE CASES

A few of the cases treated recently will be quoted to illustrate the different methods of treatment.

*Case* 1.—A girl aged 13 years had commenced orthodontic treatment for the correction of an Angle Class II occlusion. Soon after the impressions for the study models had been taken the patient was involved in a hockey accident and the two upper central incisors were fractured (*Fig.* 5). The patient reported for treatment the next day and the pulps of the teeth were extirpated. Attempts were made to use a local anæsthetic but the $\underline{/1}$ was very resistant and endotracheal anæsthesia had to be used. Later on the root canals were filled with zinc oxide and oil of cloves and gutta-percha. It was decided to use gold backed acrylic resin post crowns as the permanent restorations, but as a temporary measure, after fixing two dowel crown posts

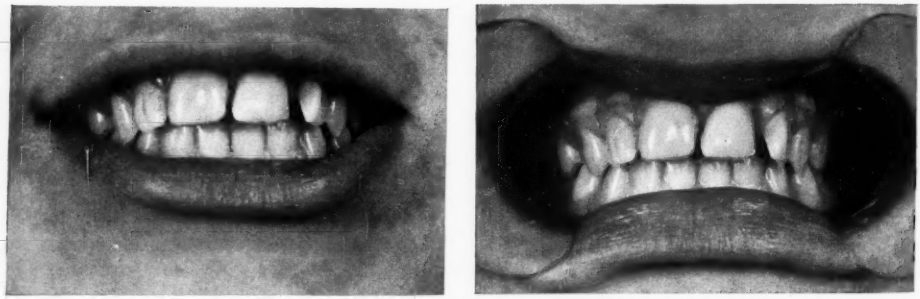


*Fig.* 6.—Same case. Silicate crowns built up.

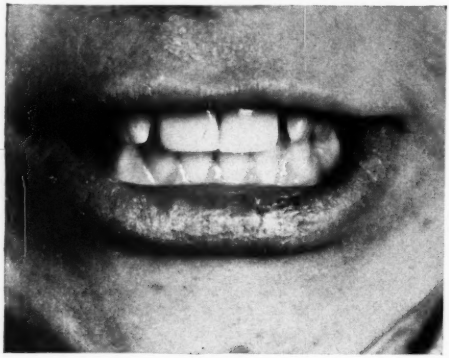


*Fig.* 7.—Same case, showing the improvement in the anteroposterior relations obtained by placing the permanent crowns in a posterior position.

with gutta-percha, silicate crowns were built up using celluloid crown forms as matrices (*Fig.* 6). This case is of interest because of the improvement in the anteroposterior relations obtained by placing the permanent crowns in a posterior position (*Fig.* 7).

*Case* 2.—A patient aged 15 years reported with a fractured incisal edge of fairly long standing (*Fig.* 8). Vitality tests showed the pulp to be normal and radiographic examination revealed a receded pulp. A temporary shoulderless jacket crown (*Fig.* 9) was fitted, to be replaced later on by one of porcelain with a more definitely prepared shoulder.

The writer always refrains from extensive preparations upon young teeth. Practical

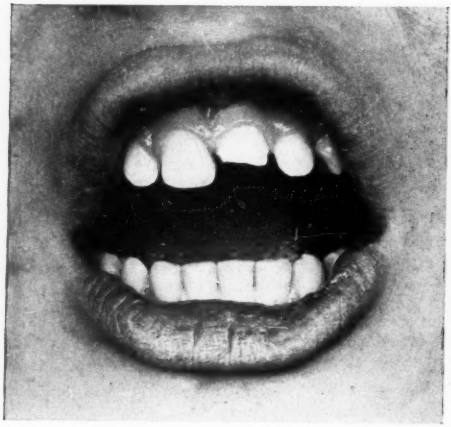


*Fig.* 8.—*Case* 2. Showing the fractured incisal edge of $\underline{/1}$.

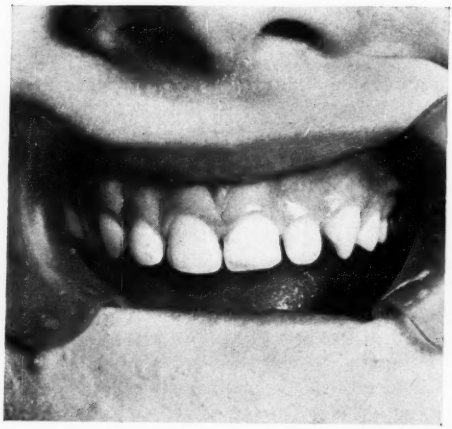


*Fig.* 9.—Same case, fitted with a temporary shoulderless jacket crown.

experience and a study of the work of Manley (1936), Fish (1927), and Lefkowitz (1942) have for a long time made him realize the danger to the pulp of excessive operative trauma to the dentine. The usual practice is to wait until at least the age of 18 before the more permanent preparations for jacket crowns are attempted.

*Case* 3.—A boy aged 12 years had lost a large section of the crown of $\underline{1}|$, the fracture line extending well below the gum margin (*Fig.* 10). The patient had waited a few days before reporting and extirpation of the pulp was decided upon. To enable easy fitting of the rubber dam the loose fragment was held in situ with an orthodontic band and access to the pulp chamber gained through the cingulum. Extirpation of the pulp was carried out under local anæsthesia and the root filled at a later date, the loose fragment being left in position. This was made use of later on to take part in the pattern for a post retained acrylic resin inlay (*Figs.* 11, 12).

*Fig.* 10.—*Case* 3. Fracture of $\underline{1}|$, the fracture line extending below the gum margin.

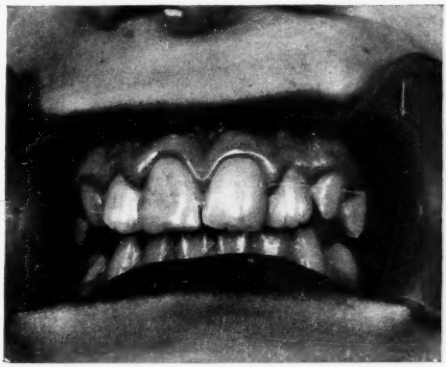


*Fig.* 11.—Same case, showing the acrylic resin inlay.

*Fig.* 12.—Same case. The inlay, designed to include the retained fragment in the pattern of post retention.

*Case* 4.—A boy aged 13 years had suffered a blow in a bicycle accident and had fractured his upper central incisors without exposing the pulps. On the first visit an acrylic resin splint (*Fig.* 4) was fitted and left in position for two weeks. The appliance, which might appear to some as rather bulky, was well tolerated by the patient and the soreness soon

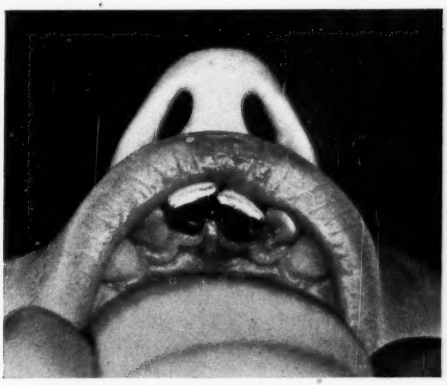


*Fig.* 13.—*Case* 4. Fractured upper incisors. Three-quarter crown preparations, with window in labial surface filled with synthetic porcelain.

disappeared. These two teeth were eventually restored by using two modified three-quarter crown preparations (*Fig.* 13) containing a window on the labial surface which was filled with synthetic porcelain. This type of restoration has been found to be particularly useful since little of the tooth substance needs to be removed and a very firm restoration with adequate retention results from the groove preparation. As a facing, synthetic porcelain is preferred because of the ease with which it is possible to obtain a satisfactory match. A good æsthetic result is much more difficult to obtain if porcelain or acrylic resin is used. A good match is often impossible and a line of demarcation soon develops which can only be removed by renewing the facing. A silicate facing can be easily replaced if it deteriorates.

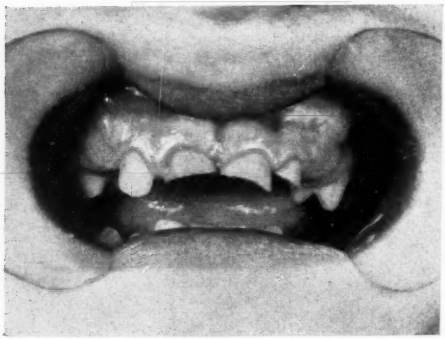


*Fig.* 14.—*Case* 5. Fracture of 1/12.

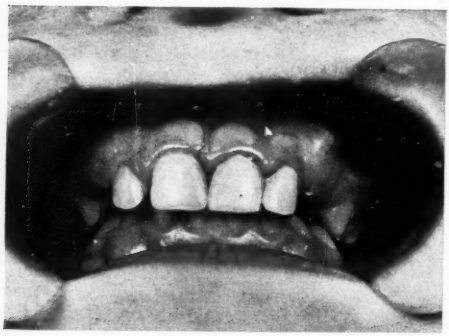


*Fig.* 15.—Same case, showing the good functional result.

*Case* 5.—A boy aged 10 years had lost practically all of the clinical crowns of 1/12 (*Fig.* 14) and X-ray examination showed that the apices were just closed. The pulps were removed under local anæsthesia. Copper bands were fitted to facilitate the fitting of the rubber dam. Subsequently post crowns with cast-gold diaphragms and acrylic resin were fitted and a good functional and æsthetic result obtained (*Fig.* 15).

It has been found possible to root treat satisfactorily those incisor teeth of children at about the age of 9 or 10 years in which the apices are nearly closed and in which the root canal will accommodate the largest size gutta-percha point. If the apices are well open, however, great difficulty will be encountered in limiting the root filling to the root canal itself. If this is attempted and the child is co-operative the operation of apicectomy done at the same time as the root filling is advised.

*Case* 6.—Another variation is shown in this case of a boy aged 13 years who had fractured two central incisors. In the upper right central incisor an exposure of the pulp had occurred and extirpation was carried out. It was decided to use a complete veneer acrylic resin crown as the restoration. So as to provide a sufficiently large crown preparation that part of the crown which remained was built up

with gold attached to a post in the root canal (*Fig.* 16). In this way a jacket crown was prepared which could easily be renewed later on if necessary without disturbing the post (*Fig.* 17).

part of the crown which remains has been bleached by using either the halogen derivatives or the oxidizing or reducing agents. The writer has had good results with sodium peroxide.

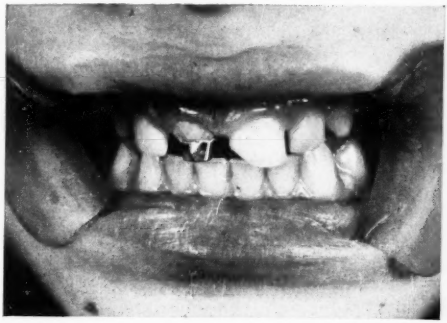


*Fig.* 16.—*Case* 6. Fracture of 1/1. Showing gold attached to post in the root canal 1/.

*Fig.* 17.—Same case, showing the jacket crown.

## SUMMARY

From what has been written it will be seen that the extraction of traumatized teeth on every occasion is unnecessary, that pulp capping or partial pulpectomy can preserve the vitality of the pulp, and that extensive preparation for jacket crowns is contraindicated until at least the age of 18. In conclusion, it must also be mentioned that fractured teeth often suffer discoloration from the decomposition products of hæmoglobin and that treatment is not complete until that

The writer wishes to acknowledge the kind co-operation of the staff of the Photographic Department of the United Sheffield Hospitals who have prepared the photographic illustrations.

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## A PRACTICAL HINT ON ROOT CANAL THERAPY

How to obtain the exact length of the gutta-percha point to be used in filling the root canal: Place a small piece of ligature or orthodontic wire, looped at one end, into the root canal and take a radiograph. Measure the length of the wire first. Measure the length of the wire on the X-ray film. Measure the length of the tooth on the X-ray film. Then use the formula given below. The length of tooth will give the length of gutta-percha point required.

$$\frac{\text{Actual length of wire}}{\text{Length of wire on X-ray film}} = \frac{\text{Actual length of tooth}}{\text{Length of tooth on X-ray film}}$$

# THE PROBLEM OF THE SENSITIVITY OF DENTINE

By **ERIC W. BRADFORD,** M.D.S. (Sheffield)

THE sensitivity of teeth is a phenomenon which has attracted a great deal of attention since conservative dentistry was first practised, for pain during this type of treatment is one of the main deterrents to the attendance of patients at the surgery. However, our knowledge of the anatomy of the innervation of the teeth is far from complete, and little is known of the mechanism of pain sensitivity in the body as a whole. This, despite the fact that the mechanism of pain is one of the most efficient in the body.

The afferent nervous system of the tooth gives rise to responses to touch, pressure, heat, cold, and pain, though it has been shown by Stewart (1927, b) that the first and second of these responses are in reality a function of the nerves of the periodontal membrane. We are concerned mainly, therefore, with the responses of the tooth, and in particular the dentine, to stimulations of heat, cold, and pain. The problem is complicated by the fact that the dentine is of mesodermal origin, whereas other tissues which give rise to pain sensations are mainly epidermal, on the exterior of the body. Indeed, dentine is almost the only mesodermal tissue which is operated on without the use of anæsthetics, either general or local.

Unlike the skin, the pulp and the dentine appear to contain no specialized nerve-endings, so that the only sensations transmitted would be expected to be similar to those of the intra-epithelial nerves of the free-ending type, which are thought to subserve the appreciation of pain. Even so, the presence of this type of nerve in the dentine would not of itself explain the sensitivity of the dentine, as it has been shown by Waterston (1933) that it is possible to cut large numbers of this type of fibre when shaving off the epithelium without producing any sensation of pain in the subject. It is only when the corium is reached that the sensation of pain arises. This observation points to the fact that the problem of the conduction of impulses through the dentine to the nerves of the pulp is not merely one of proving the presence of nerve-fibres in the tissue, but, if these fibres are present, of showing by some means that they produce sensations of pain when stimulated, and of ascertaining the method by which the fibres are stimulated. It can be observed clinically that there exists some agency for the transmission of impulses from the cut surface of the dentine to the nerves of the pulp, though the agent is unknown. Thus it is conceivable that sensations such as heat, cold, and electric shock could be transmitted by the calcified matrix, without the intervention of what is generally considered to be living tissue. The conduction of pain, however, is a matter of some conjecture. It may be that stimulation of the exposed surface of dentine affects nerve-fibres which travel through the tissue and are continuous with the nerves of the pulp, or that the dentinal processes of the odontoblasts are stimulated, and that they in turn affect the nerves of the pulp.

The problem may therefore be tackled from two different angles:—

1. A critical survey may be made of all evidence and past work, to establish whether or no nerve-fibres traverse the dentine.

2. An attempt may be made by experimental methods to establish the agency, whether nervous or otherwise, which transmits the impulses from the exterior to the pulp.

At the start of an investigation the first method of attack is usually chosen, and so this paper is concerned mainly with a summation of past work.

Most previous work on the subject of the conduction of impulses through the dentine has taken the form of a histological investigation into its structure in an attempt to show the presence of nerves in its substance. The

findings have been most conflicting, the more so as a positive result was, from the histological aspect, of more consequence than a negative finding. A quick glance through the literature and the results of previous workers shows that there are three quite definite divisions of opinion: there are those who have had negative findings; there are those who have shown nerves penetrating the predentine; and there are those who maintain that there are large numbers of nerves in the dentine, reaching to the amelo-dentinal or cemento-dentinal junctions.

Before proceeding further with the discussion it is necessary to examine closely the results of previous workers, in order to ascertain if possible the reasons for these three conflicting groups of findings. For convenience these will be grouped, not according to historical order, but according to the results. The results of the group of workers who are half-way between the other two will be grouped with those who had negative findings, for reasons which will be explained later.

1868: Boll stained structures in the dentine, which he considered to be nerves, with gold chloride and chromic acid.

1907: Law, using Bethes toluidine blue, claimed to have demonstrated nerves in dentine.

1910: Mummery, in a series of experiments, 1910–24, using iron and tannin, and Beckwith's gold chloride methods, concluded that: "The nerves of the dental pulp lose their medullary sheaths and neurilemma just beneath the odontoblast layer, and are seen to form a plexus of neurofibrils in this situation, the plexus of Raschkow; from this plexus they pass in approximate straight lines between and around the odontoblast cells, and form another narrower plexus at the inner margin of the dentine, which I have called the marginal plexus. They very closely envelop the cells and the dentinal fibrils and pass into the dentine with the latter. They can be traced as beaded fibrils along the tubes and their very numerous branches, and are seen to terminate in fine ramifications of the dentinal tubules beneath the enamel and the cementum."

1913–15: Dependorf, using silver impregnations, reached the conclusion that the nerve-fibres entered the dentine along with Tomes' fibres, which they may penetrate, or they may pass into the ground substance, to end in slightly bulbous thickenings at the amelo-dentinal junction.

1914: Fritisch, using Bielschowsky and Cajal silver impregnations, reached the same conclusion as Dependorf.

1924: Carol Montfort, using De Castro's modification of Cajal silver, demonstrated an intricate mass of stained structures in the dentine, extending from the pulp to the enamel and the cementum. These stained structures were believed to be nerves.

1927: Dieck, using Bielschowsky's silver impregnation, demonstrated stained structures which accompanied or adhered to Tomes' fibre. These results were confirmed by Tojoda (1934).

1933: Riegele also confirmed the results of Dieck and added that the nerve-fibres terminated in a network around the odontoblast fibres.

1934: Munich, using osmium-tannin, concluded that stained structures proceeded through the dentine matrix, not through the dentinal tubules.

1935: Van Der Sprenkel, using Bielschowsky and also De Castro's modification of Cajal silver impregnations, stained structures which he considered to be nervous, which took an intertubular course in the dentine, or were embedded in Tomes' fibre.

1949: Illyes, using silver impregnations, stained structures similar to those previously noted by Montfort.

To summarize, it may be said that in all probability these workers all observed some structures in the dentine which stain with silver, particularly De Castro's method, with toluidine blue, gold chloride, iron and tannin, osmic acid, and various modifications of these stains. These structures appear to have differed to some extent, probably owing to the different methods of decalcification used, and the age of the material, but these results cannot be gainsaid unless it is possible to show that the structures stained were not

nerves but nevertheless are always present in dentine.

It is now of interest to examine the work of those who reached the conclusion that there are no nerves in dentine or only in the pre-dentine, and to examine the methods used.

1879: Magitot and Le Gros, working on *enucleated* pulps, concluded that the nerve-fibres were continuous with the central processes of the odontoblast cells.

1882: Bodecker, using gold chloride on *enucleated* pulps of full-term fœtuses, concluded that the nerves were in intimate contact with the odontoblast cell.

1893: Retzius, using Golgi's method, studied the course of the nerves in the teeth of various vertebrates. In each case he found that the nerves of the pulp passed through the odontoblast layer and ended in knotty points on the under surface of the dentine.

1897: Robertson, using osmic acid on the pulps of oxen, concluded that the odontoblasts were neurosensory cells.

1898: Huber, using intra-vitam methylene blue, studied the pulps of the teeth of rabbits and his conclusions confirmed those of Retzius.

1894–1924: Hopewell-Smith described a connexion between the nerves of the pulp and the odontoblasts, the former "terminate in a basket of varicose fibres embracing and often closely attached to the cell walls of the odontoblasts". Further, as it was thought that all impulses must be transmitted by nervous tissue, he propounded the theory that the odontoblasts had nothing to do with the formation of dentine, but that this was formed from a layer of small round cells.

1927: Stewart undertook to repeat the work of Mummery, and found that the fibres described by the latter did not degenerate on section of the inferior dental nerve. Also that although they stained with gold and silver salts, they did not show a typical nervous staining with Mallory's connective-tissue stain. He came to the conclusion that purely histological methods would not settle the problem of the innervation of dentine.

1936–38: Later, in co-operation with Lewinsky, Stewart was able to show the presence of nerves in the pre-dentine.

1929: Chase compared the results of eleven differential staining or impregnation methods. He demonstrated that the fibres described by Mummery and others as nerve-fibres were identical with the fibres of Von Korff. He failed to demonstrate nerve-fibres in the dentinal tubes or matrix except for argyrophilic fibres which he thought might be nerves which entered the orifices of the dentinal tubules before retracing their path into the pulp.

1931: Calderon, using silver impregnations, concluded that the nerves of the pulp ended in expansions close to the nuclei of the odontoblasts; some branches travel towards the dentine between the odontoblasts, but change their direction at the dentine face and run parallel to the latter.

1932: Sealey, using Bielschowsky's silver impregnation, was able to trace fibres into the pre-dentine, but no further.

1932: Tiegs concluded that the nerves could be followed into the pre-dentine, where they ended as knotty points on Tomes' fibre.

1936–39: Bradlaw, using several silver impregnations, was able to demonstrate nerve-fibres which formed simple loops in the pre-dentine. He showed one specimen in which an argyrophilic fibre appeared to penetrate a dentinal tubule.

1939: Wasserman, using the dentine of rats, came to the conclusion that there are two types of nerves in the pulp, one type which penetrate the pre-dentine, and the other type which terminate in a plexus in the region of the odontoblast cells.

1939: Weatherford, also using rats' teeth, concluded that the nerves of the pulp ended in the odontoblast layer.

1943–44: Ambrose tackled the problem from the point of view of the contents of the dentinal tubules, and reached the following conclusions: (1) On sectioning the inferior dental nerve, there is no change in the contents; (2) The dentine of stillborn infants can contain no nerves, as the teeth are not innervated, yet the contents of the tubules

do not differ markedly from those of the adult.

1948: Bernick, using Pearson's silver gelatine method, traced the recurrent paths of argyrophilic fibres from the pre-dentine to the pulp, and suggested that the formation of these loops may be due to a retreating of the odontoblasts with dentine formation, leaving behind the nerve-fibres.

It will be seen that these latter workers used much the same methods as those who maintain that dentine is innervated; therefore it may be said that the controversy lies not in the methods but in the interpretation of the results of those methods. There have, of course, been refinements in technique, but this does not appear to have affected the issue, and it is considered unlikely that any new staining method will resolve the controversy. A striking feature of previous work is that few workers appear to be satisfied that their interpretation of their results and the results of others represents the true picture.

It must be admitted that dentine contains argyrophilic fibres; the fact that so many workers showed their presence makes this undeniable, but as several who maintain that dentine is not innervated attempted to show, these fibres may not be prolongations of the nerve-fibres of the pulp. Stewart (1927, b) suggested that the only criterion of whether a structure was a nerve or not was whether it could be traced into continuity with the main nerve-trunk of the pulp. What, however, is meant by continuity? A series of connective-tissue fibres which appear to be continuous at magnifications of 200, lose continuity when examined at 500, and discontinuous fibres at 1000 may appear to be continuous at 500. This is an interesting point, as most of the photographic evidence of the innervation of dentine is of the order of magnification of 500 or less. The question of continuity is also confused by the use of thick sections; it is admittedly easier to follow a continuous fibre through a thick section than through a series of thin ones, but it is also easier to mistake discontinuous for continuous fibres in thick sections as the higher magnifications cannot be used. This is especially important when it is remembered that the structures found in the dentine or pre-dentine cannot be identified in every section; indeed they appear to be the exception rather than the general rule.

The question of the non-specificity of stains for nervous tissue also aggravates the problem. Whilst it is possible to subdue the staining of connective tissue to such an extent that there is no possibility of confusion with nerve-fibres, it is not possible at the moment to differentiate with any degree of exactitude between connective-tissue fibres and terminal nerve fibrils. Also it will be noted that the region in which continuity between the nerves of the pulp and the structures of the dentine are lost is the odontoblast layer. In this region the connective-tissue fibres are pre-collagenous and impregnate heavily with metals, as well as tending to stain with hæmatoxylin, and toluidine blue; this tendency is much more marked in the undecalcified specimen than in the decalcified specimen, though it has not been found possible to suppress these staining properties sufficiently to differentiate between nerve-fibres and these fibres of Von Korff.

There is a further histological observation which has a bearing on this question of continuity, that in decalcified specimens of dentine with the pulp in situ there is a cell-free area situated between the odontoblasts and the next layer of pulp cells. This layer does not appear to be crossed by any fibres which stain with hæmatoxylin; therefore there has arisen the theory that the nerve-fibres in this area lose their myelin sheaths and neurilemma, and therefore become similar in staining properties to connective-tissue fibres. This basal layer of Weil would appear to be greatly exaggerated in tissue which has been decalcified (*Fig.* 1).

The odontoblasts are held to the dentine by their dentinal processes, so that when the pulp shrinks owing to a precipitation of the mucoid ground substance, it appears to be connected with the odontoblasts by a reticulum of stretched connective-tissue fibres. In histological specimens produced by methods which do not cause this precipitation, the basal layer is much reduced or missing (*Fig.* 2).

This, then, represents a weakness in the theory that the dentine is innervated by the

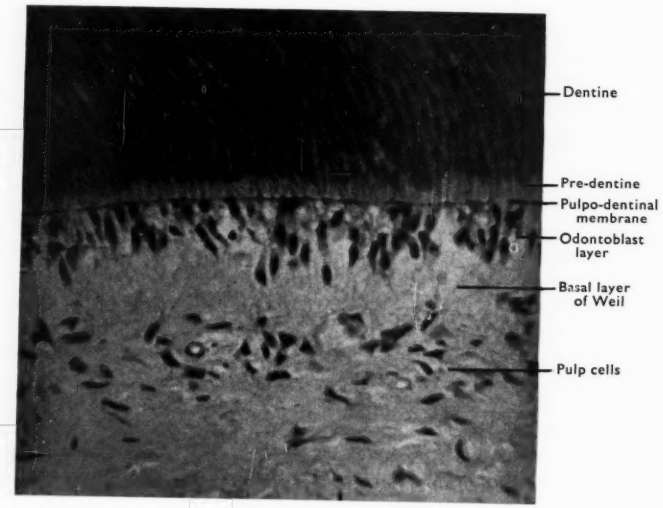


*Fig.* 1.—Decalcified section of pulp and dentine, stained Masson's connective-tissue stain. Note the cell-free area between the odontoblasts and the first cells of the pulp. (× 500.)

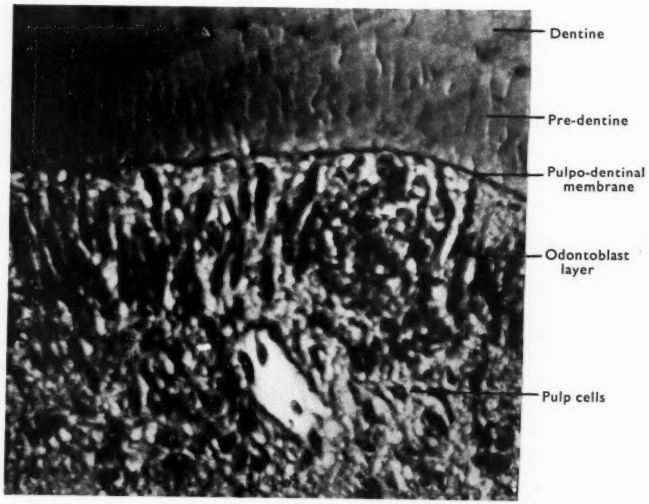


*Fig.* 2.—Undecalcified section of young dentine and pulp, stained Masson's connective-tissue stain. Note the absence of the basal layer of Weil. (× 500.)

passage of fibres between the odontoblasts to form a marginal plexus on the pulpal surface of the dentine from which fibrils pass to the tissue. The nerve-fibres which were drawn away from the odontoblasts by the contraction of the pulp, appear to be connected to the pre-collagenous fibres which pass between the odontoblasts to the pulpal surface of the dentine.

It will be noted that certain workers, on both sides of the controversy, speak of a marginal plexus between the odontoblasts and the pre-dentine, or of nerve-fibres which pass between the odontoblasts, then turn, and run parallel with the dentine surface. It has been shown (Bradford, 1950, a) that in this area there is a membrane termed the pulpo-dentinal membrane, which is always present and is probably composed of mucoid tissue, which stains very similarly to nervous tissue. This membrane in section can quite easily be mistaken for nervous tissue, and it may be that in describing the path of so-called nerves, these workers were actually describing the connexion between the pulpo-dentinal membrane and the fibres of Von Korff.

A further point of note from the histological aspect is that the upholders of the theory that dentine is innervated maintain that the nerve-fibre passes up the dentinal tubule accompanied by Tomes' fibre. Recent work tends to show (Bradford, 1950, b) that the dentinal tubule is only present in decalcified specimens, being replaced *in vivo* by the translucent area. This translucent area probably represents a highly calcified zone. It is also suggested that Tomes' fibre consists of the odontoblast process surrounded by a mucoid sheath. Therefore if these observations are correct, any nerve-fibre passing into the dentine must either pass through a highly calcified area, which occurs nowhere else in the body, or within the mucoid sheath of the odontoblast fibre. The mucoid tissue found in the dentine, the pulpo-dentinal membrane, and around the odontoblast cells is of an acid character, and therefore reacts to stains in much the same way as do nerve-fibres. Also, being a sugar base, it reacts with metallic impregnations so that it is impossible to distinguish the one from the other by the routine histological methods at present available. The question immediately arises, therefore, as to whether the workers who found fibres in the dentine were not in fact staining the mucoid content of the dentine. The distribution of these argyrophilic structures as shown by Montfort (1924) and Illyes (1949) certainly corresponds exactly to the distribution of the mucoid tissue in the dentine.

Owing to the apparent impossibility of deciding on purely histological grounds whether or no dentine is innervated, it might throw some light on the subject if the various theories were tested against observed clinical phenomena. If the nerve-fibres penetrate only a short distance into the dentine or pre-dentine, then stimuli from the amelo-dentinal junction must be conducted by some other agency. This agency may be the dentinal processes of the odontoblasts or, as is held by some, the column of fluid in the 'dentinal tubule'. As previously mentioned, it is thought that the dentinal tubule only exists in decalcified specimens, so there are left only two theories on the path of conduction through the dentine—the nerve-fibres which may be present, or the dentinal processes of the odontoblasts.

The response to all noxious stimulation of the dentine is a sensation of pain. If it is supposed that the dentine is innervated, this observation would be compatible with the presence of nerve-endings of a non-selective type in the dentine, similar to the free nerve-endings of the epithelia. This is corroborated to some extent by a survey of the thickness of the nerve-fibres supplying the teeth. Thomas (1946) showed that 76·3 per cent of the fibres of the inferior dental nerve are less than 10 $\mu$ in cross-section; nerves of this calibre have been shown by Bishop (1943) to be associated with tickling and itching, and are thought to be in the pain modality. From this it might be assumed, and is in fact observed, that stimulation of dentine with heat, cold, and chemical irritants produces sensations of pain which vary only in intensity. This phenomenon could equally be explained by assuming that there are no nerves in

dentine: in which case it would be expected that the response to all harmful stimuli would be the same, as this is a characteristic of protoplasm. It can be further observed that pain varies considerably from patient to patient, from tooth to tooth in the same patient, and even within the individual tooth. It would be difficult to explain these variations if all dentines were equally innervated, whereas it is quite easy to conceive that the reaction of an odontoblast will be dependent upon its degree of activity. A variation in this latter can be observed in various parts of the same tooth.

Unless circumstances of disease intervene, the teeth become less sensitive with increasing age. This could be attributed to a change in the state of activity of the odontoblasts, which would normally occur in the early twenties and late teens with the cessation of dentine formation; to the blocking of the dentinal tubules by a deposition of secondary dentine in response to attrition; or to the gradual calcification of the dentinal tubules that occurs in later life. The calcification of the tubules would produce a very gradual loss of sensation, which would not be noticeable until a large number of tubules were thus blocked, and it has not yet been suggested that this sclerosis of the dentine occurs in subjects in the twenties. The forming secondary dentine appears to be the only portion of the dentine in which many workers have been able to show the presence of nerves, so that this could hardly be put forward as a reason for a decrease in the sensitivity of dentine. This leaves as an explanation the cessation of activity of the odontoblasts which coincides with the decrease in the sensitivity of the dentine.

Other observed phenomena, such as the sensitivity of the amelo-dentinal junction, the decrease in sensitivity once this area is passed, the further gradual increase as the pulp is approached, and the insensitivity of dead tracts and other pathological conditions may be explained equally well on the basis of either theory.

As dentine is a connective tissue, it was hoped that a comparative study of other such tissues in the body might throw some light on the problem. Work which has been carried out on other structural connective tissues, however, lends no support for the theory that nerves traverse the dentine. Cementum when exposed to the oral fluids in some patients becomes very sensitive, yet no nerves have ever been traced into its substance. So far as records have been searched, there is no evidence for the presence of nerves in cartilage. Of the work on the innervation of bone, Leriche (1930) noted that osteotomy under infiltration anæsthesia required the introduction of more novocain for each millimetre of cutting, and that bone-marrow and the periosteum are well known to be very sensitive. Hurrell (1937) observed that other workers had succeeded in tracing nerve-fibres amongst the osteoblasts of the medullary spaces, and that nerves had been seen to enter nutrient canals along with the nutrient vessels. He tried many staining methods in an attempt to trace nerves into the calcified ground substance of bone, but came to the conclusion that these were very fickle. Only in one block which was stained with De Castro's modification of Cajal's silver technique was he able to show any nerve-fibres ending in the bone matrix. "An idea of the richness of the supply may be gained from the fact that no part of the field of a 1/6 lens is without nerve-fibres." In fact the story of the innervation of bone reads very similarly to that of the innervation of dentine, the results of Hurrell being comparable to those of Montfort, using an identical technique. The weight of evidence suggests that bone matrix contains no nerve-fibres.

It might be thought that some light would be thrown on the problem by studying the pharmacology of obtundents, but unfortunately this has not so far been the case. It is no exaggeration to say that at one time or another nearly every substance in *The British Pharmacopœia* which has any anæsthetic properties at all has been tried in an attempt to anæsthetize the dentine by surface application. Some have been hailed as panaceas in their time, but owing to the difficulties of application, and differences from patient to

patient, they have with mounting lists of failures passed into pharmacological history. This has led to the present position, where sensitive dentine is either treated at the expense of the nerves of both operator and patient, or recourse is made to infiltration anæsthesia.

If possible nerve-fibres in dentine are responsible for the transmission of impulses to the pulp, then the obvious drug to use for the anæsthetization of the tissue is a surface anæsthetic such as cocaine or percaine; however, unless these fluids can be forced through a thin layer of dentine into the pulp they are without effect. Refrigeration, which markedly affects the speed of transmission of nerve impulses in other parts of the body, has been tried on the surface of dentine by the evaporation of highly volatile liquids such as alcohol, chloroform, or ether. However, it has been shown by Pfaffman (1939), working on the incisors of cats, that changes in temperature of the teeth between 0° C. and 70° C. do not markedly alter the rates of transmission of noxious impulses from the tooth to the brain. Moreover, it would be extremely difficult to maintain temperatures of less than 0° C. throughout the dentine. This is not to say that such methods of refrigeration do not reduce the heat produced during cavity preparation, and are not invaluable as a method of preventing heat damage to the pulp.

The possibility that the sensitivity of dentine might after all be a function of the odontoblast process led to many attempts to occlude the dentinal tubule, the theory being that the precipitation of the protein of the protoplasm of Tomes' fibre would form a barrier. To this end, various protoplasmic poisons and toxic metal salts were used, but their effect proved transitory, and moreover it has been shown by histological methods that whereas in low concentrations these substances may be beneficial in stimulating the production of secondary dentine, they may cause irreparable damage to the pulp tissue. It was suggested that the adsorption of fluorine into the calcified matrix of the dentine might cause an occlusion of the dentinal tubule, but in cavity preparation this substance caused intense pain, and probably acted as a tissue poison.

Reasoning that inhalation anæsthesia appears to be dependent upon the fat solubility of the substance used, Hartman (1936) attempted to introduce these fat solvents into the dentinal fibrils by surface application. It has been shown, however, that the degree of penetration of Hartman's solution was in the region of 0·05 mm., and it is surmised that the anæsthesia produced by this solution was probably caused by a small amount of surface refrigeration.

The pharmacological aspect, therefore, throws only a negative light on the problem, in that it points to the possibility of the dentine containing no nerves which are responsible for the transmission of impulses through it to the pulp, and yet adds no clue as to the actual method of conduction.

## CONCLUSIONS

The problem of the sensitivity of dentine is intimately bound up with the general problem of the mode of stimulation of pain nerve-endings in the body as a whole, and the solution of one is not likely to occur without giving a clue to the solution of the other. A survey such as this, however, does indicate that sufficient groundwork has been done to reach a number of conclusions. The first of these is that the only evidence to support the theory that the dentine is innervated comes from the histological side. Even this, however, as has been noted, is open to doubt in the light of recent work on the structure of the tissue. Secondly, even if nerves are present in the dentine, they do not appear to be the agency for the conduction of stimuli to the pulp, otherwise it should be possible to anæsthetize them, and the marked drop in sensitivity of the dentine in the late teens goes unexplained. The only alternative method of conduction is the dentinal process of the odontoblast. This raises the question of the conduction of impulses by non-nervous tissue, which many years ago was one of the main arguments put forward by the supporters of the theory that dentine was innervated. This theory on the necessary presence of nervous

tissue has already been questioned in other parts of the body, such as the muscular transmission of impulses in the heart. Actually this problem in the dentine is not a question of transmission of impulses; what is happening is that a pulp cell is being stimulated, and this cell then reacts, the effect of the reaction being to stimulate the nerves of the pulp. How this reaction and stimulation occur is unknown, though there is the possibility that it is of a chemical nature, the chain of reactions being set in motion by the damage to the odontoblast cell. If it could be established that there was no nervous tissue in the dentine, then this tissue would make an excellent subject for investigating the question of pain appreciation in the body as a whole.

## SUMMARY

An attempt has been made to summarize the histological work on the problem of the innervation of dentine, and to assess the value of this work in the light of present knowledge of the structure of dentine. This review was inconclusive, though there evolved two possible theories for the sensitivity of dentine: (1) Stimuli from the cut surface of the dentine are transmitted to the pulp by nerves which are in continuity with those of the pulp. (2) There are no nerves in dentine, and stimuli are conducted to the nerves of the pulp by the dentinal processes of the odontoblasts.

These two theories were then tested against observed clinical phenomena, and the evidence which could be obtained from the study of obtundents and the study of analogous tissues. It was concluded that the only evidence supporting the theory that dentine contains nerves came from the histological side, and that even this was open to doubt; and further that even if the tissue does contain nerve fibres, these do not appear to be responsible for the transmission of impulses from the surface of the dentine to the pulp.

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"As is our Pathology, so is our Practice."—SIR WILLIAM OSLER.

## CORRECTION

IN the September number, on p. 6, the illustrations for *Figs.* 9 and 10 were unfortunately transposed. The captions, however, were correct.

# DERMOID CYST OF RIGHT AND LEFT OVARIES

By RONALD RASTALL, L.D.S. (Sheffield)
*Senior Hospital Dental Officer, Dental Department, Royal Hospital, Sheffield*

Miss S, aged 21, was admitted to the General Surgical Department complaining of a pain in her left iliac fossa on and off for the last five years. It became worse on walking and recently had wakened her up at night. She had noticed a lump in her left iliac fossa three weeks previously.

*On Examination.*—There was a smooth, fixed swelling arising in the pelvis and easily palpable above the pelvic brim; to its left side and above it was another smooth, hard, but mobile, swelling, the size of a hen's egg.

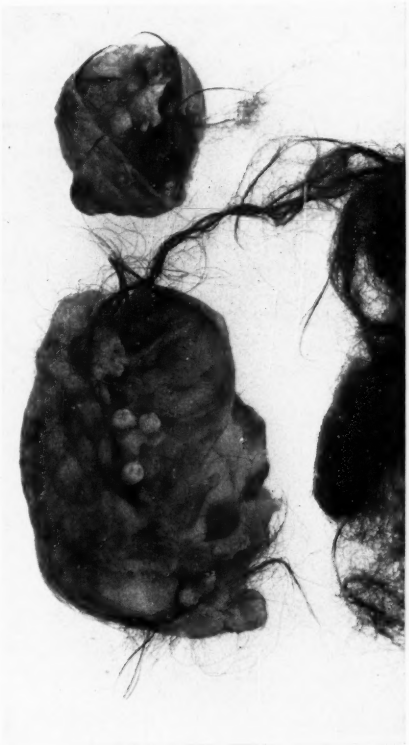


*Fig.* 1.—Photograph showing both cysts, with teeth and mass of hair.

*At Operation.*—There was found a cystic right ovary occupying the whole of the pelvis and a cystic left ovary lying free on top. A bilateral oöphorectomy and salpingectomy was performed.

*Fig.* 2.—The larger cyst, showing the three premolar-like teeth mounted in a ridge.

*Pathology.*—Reports were as follows :—

1. A left ovary cyst 12 cm. in diameter containing hair and grease with three premolar-like teeth and one lower incisor-like tooth mounted on two eminences and connected by a ridge (*Figs.* 1, 2). X-ray examination of the contents showed well-calcified

teeth mounted in a bony ridge resembling mandible.

2. A right ovary cyst, 5 cm. in diameter, containing hair and rudimentary teeth (*Fig.* 1).

Malignancy was not evident in either case.

I am indebted to Mr. D. Aiken, F.R.C.S. Chief Surgical Assistant of the Sheffield Royal Hospital, for permission to publish his case and to Mr. F. R. P. Larway for the photographs.

# AN UNUSUAL CASE OF PAGET'S DISEASE

By **RONALD RASTALL**, L.D.S. (Sheffield)

*Senior Hospital Dental Officer, Dental Department, Royal Hospital, Sheffield*

Miss H, aged 43, came to the Dental Department of the Sheffield Royal Hospital in a highly nervous state. Her appearance was unkempt and slovenly and she complained of a large swelling which prevented her from closing her mouth. She was certain that this was a cancer and her condition was one of hopeless despair.

*On Examination.*—There was a large, bony, hard swelling in upper right 8765/ region with a tooth, probably 7/, standing at the lowest point of its convexity. The 7/ was the only tooth remaining in the upper jaw and the lower six front teeth were the only teeth in the lower jaw. The patient had not worn dentures (*Fig.* 1).

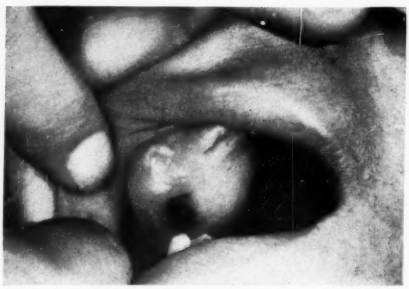


*Fig.* 1.—Photograph of tumour after removal of 7/ and before operation.

The swelling was such that the 7/ was biting heavily on the lower gum and her mouth was in a permanently open position. The condition produced no pain other than soreness of the lower gum due to occlusion of 7/ and was said to have been present for several years, the swelling slowly increasing in size.

X-ray examination showed a circumscribed area in 8765/ region containing radio-opaque irregular outlines and a retained root of 6/ within a bony matrix suggestive of a dentigerous cyst (*Fig.* 2). Clinically, however,

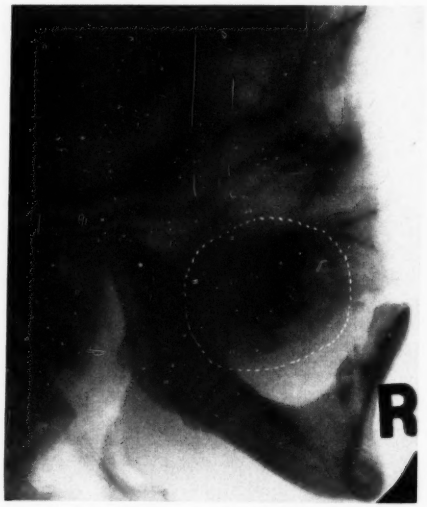



*Fig.* 2.—Lateral jaw X-ray of tumour showing dentigerous-cyst-like appearance of tumour.

this was not thought to be a dentigerous cyst but rather a bony tumour. Further X-rays of the skull showed a well-marked area of porosis extending far back, with dense mottling interspaced in the frontal area, the appearance being that of Paget's disease of a rather unusual type (*Fig.* 3). A blood investigation was carried out and the laboratory report was as follows:—

Heparinized blood, Hb 92 per cent (1·35 g.)
W.B.C., 7,000 per c.mm.
B.S.R., 10 mm, in one hour.
Serum inorganic phosphates, 3·1 mg. per cent.
Serum alkaline phosphates, 57 units.
Serum-calcium, 10·4 mg.

The provisional diagnosis was osteitis deformans.

*On Admission.*—The patient was admitted to hospital and the swelling in 8765/ region excised. It consisted of an outer layer of soft,

*Fig.* 3.—Frontal view of skull, showing area of porosis extending from malar region to top of skull on right side.

spongy bone with dense irregular-shaped nodules of a hard bone in a matrix of soft spongy material. The area extended from 4/ to the tuberosity; upwards to the floor of the orbit, the antrum being obliterated; and laterally to the midline of the hard palate. The whole area was evacuated and the palate sutured back into position, leaving a space for drainage of the remaining cavity. The cavity was packed with 'sulphatulle'.

Two days later the pack was removed and slight hæmorrhage occurred. The cavity was repacked. After a further two days the pack was again removed and the cavity was found to be in a clean condition and was left open. At the end of one week the opening into the cavity had closed and the patient was discharged (*Fig.* 4).

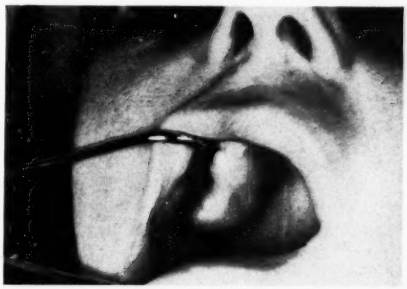


*Fig.* 4.—Photograph of mouth after operation showing considerable reduction in size of 'tumour area' before insertion of dentures.

*The Specimen.*—The laboratory report on the specimen was as follows:—

*Macroscopical*: Tumour from right maxilla, containing many calcified irregular fragments, the largest being 2·5 × 1·5 × 1 cm.

*Microscopical*: Cancellous bone partly replaced by fibrous tissue, some of which was œdematous and one small area of which shows chronically inflamed granulations. A few osteoclasts were apparently engaged in bone removal. No neoplasm was present in the tissue examined.

*Progress.*—One month following operation further X-rays were obtained. The radiologist reported; "the tumour appears to have been completely removed. No debris or tumour can be seen".

A full upper and part lower denture was fitted. After sundry adjustments and easings spread over a period of two weeks, the patient came to see me before finally being discharged. The psychological effect of having the 'tumour' removed and being reassured that the condition was not cancer was remarkable. She was now neatly dressed—had gone to some obvious care and trouble to be correctly made up, and her whole appearance and outlook on life was changed.

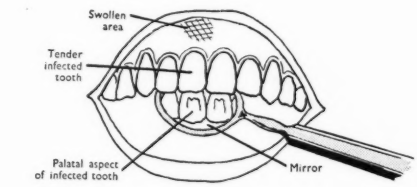
# ILLUSTRATED HINTS

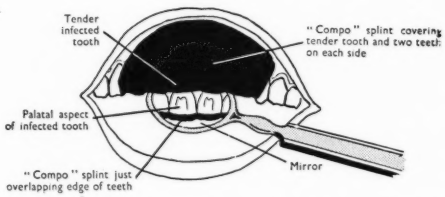
## STABILIZER FOR APICALLY INFECTED TOOTH WHILST DRILLING TO ALLOW DRAINAGE

It is often necessary to open the pulp canal of an apically infected tooth in order to obtain adequate drainage, and frequently the tooth is partially extruded from its socket and exceedingly tender to touch.

*Method*: Thoroughly soften a small piece of composition and then with a finger palataly on the affected tooth gently mould the "compo" over the labial aspect of the tooth and two teeth on each side, covering the gum above as well. Allow to harden somewhat, remove and chill, or, alternatively, chill whilst in the mouth.

If the chairside assistant now holds this "splint" in place it is exceedingly simple for the operator to drill through the palatal aspect into the pulp chamber of the tooth, using a small drill so that vibration is at a minimum and keeping a steady pressure on the tooth all the time.





Tender infected tooth
"Compo" splint covering tender tooth and two teeth on each side
Palatal aspect of infected tooth
Mirror
"Compo" splint just overlapping edge of teeth

**READERS!** Let us have that hint of yours, and, if possible, send us a rough drawing or a photograph to illustrate it.

All hints published will be paid for at the standard rate for contributions.

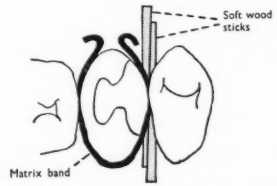
We are relying on *YOU* to keep these pages going and to help your colleagues with useful hints.

*The Editor.*

## A SIMPLE WEDGE

### FOR ACCURATE ADAPTATION OF MATRIX BAND TO CERVICAL MARGIN OF COMPOUND CAVITY

Two soft wood sticks, as used for gum massage, are put between the teeth, one being entered from each side. In this way the matrix band is




kept in close contact with the cervical margin of the tooth whilst the amalgam is packed into place.

# FOR THE TECHNICIAN

## CONSTRUCTION OF DUST TRAP FOR BENCH MOTOR

To-day, with the increasing use of acrylics, small bench motors with a carborundum wheel have become very popular. In one respect, however, they can be a nuisance—the acrylic dust flies over the bench, embedding itself in the wax of the case being set up, and getting into the nostrils of the operator. This can be overcome by constructing a small trap, which is easily made from a Zelex tin. Cut the tin to the dimensions shown in *Fig.* 1. Height and width measurements are

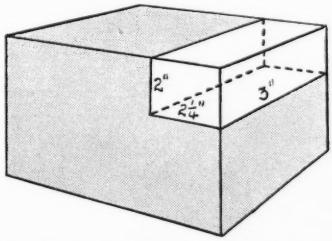



*Fig.* 1.—Zelex tin, showing portion to be used.

¼ in. over final size (compare with *Fig.* 2). This is for two reasons: (1) To form a "lip" to slide under wooden blocks screwed to the bench and support at the back (*Fig.* 2, A); (2) To avoid sharp edges on the front edge (*Fig.* 2, B). Having cut the section from the tin, four cuts ¼ in. deep are made at the back and front corners. The bottom parts are then bent out at right angles. The front edges turned in and clamped together with pliers.

Two wooden blocks ½ in. wide and 2 in. long are cut, and the trap placed in position on the bench and the blocks screwed down.

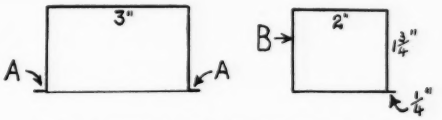



*Fig.* 2.—Front and side views, showing flanges.

The trap should be a fairly tight fit under the blocks, but free enough to allow removal, by sliding forward, for sweeping down the bench.

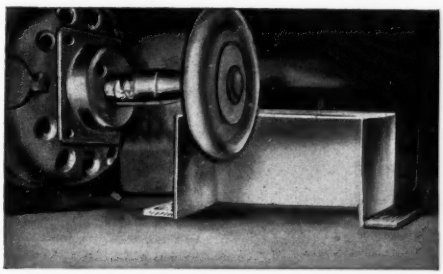


*Fig.* 3.—The trap in position on the bench.

The paint on the tin can be removed with methylated spirit and the trap is ready for use.

## NEED FOR ABSTRACTING SCIENTIFIC JOURNALS

Conservatively it has been estimated that at least 750,000 reports (scientific papers) are published annually—and some authorities place the number as high as 2,000,000 annually. Some of these research reports appear as technical books, dissertations, and bulletins, but mostly they appear as articles in scientific periodicals, and such periodicals number possibly 50,000. No library possesses all of them, hence inter-library borrowing and the distribution of photographic copies of documents are important features in the dissemination of information among scientists.—FLYNN, JOHN E. (1949), *Unesco Courier*, **2**, No. 9, July.

# THE STERILIZATION AND CARE OF HYPODERMIC SYRINGES

[*So important is this subject that we feel that the following article will be of great general interest. It has been taken in the main from a booklet with the above title recently issued by Messrs. Hodgson & Walkley Ltd., and permission to quote from it has been given by Mr. P. Hodgson.—Editor.*]

## THE STERILIZATION OF HYPODERMIC SYRINGES

Sterilization was once considered simply as the killing of all living organisms in the material concerned, but the concept has now broadened considerably in its medical and pharmaceutical aspects.

Bacteria are the most ubiquitous form of life, and are characterized by extraordinary capacity for growth and reproduction under favourable conditions.

The disease-producing bacteria are naturally of primary importance from a sterilization point of view, but in certain circumstances some non-pathogenic bacteria may exhibit pathogenic properties.

For optimum growth, bacteria require a solution containing organic matter and certain mineral salts at a suitable *p*H and temperature, but slow growth can take place even when the concentration of nutrient material is very low. They can grow, for instance, in distilled water.

When conditions are unfavourable to growth, a number of bacteria are able to evade the difficulties of the situation by the formation of spores. These spores are very resistant to heat and antiseptics and they can remain dormant for long periods, but on the return of conditions favouring growth, the spore coat ruptures, and normal vegetative growth begins again.

Spores are of considerable importance when considering sterilization, as their power of resistance is so remarkable.

Many of the failures of sterilization can be traced to spores that have escaped destruction. The vegetative forms of bacteria are destroyed fairly easily by the standard sterilization processes, but this may not always apply to the spores.

If a material to be sterilized is exposed to a sufficient degree of heat for a sufficient length of time, all bacteria and their spores will be killed.

In practice, however, a number of factors can affect the final result to a marked degree: for example, the temperature at which bacteria succumb is affected by the presence of water. When water is absent a higher temperature is required, especially when the killing of spores is considered, for in the presence of moisture the spore coat swells and eventually ruptures, thus exposing the protoplasm to the effects of the heat. Reliable data on the time required to kill all bacteria at a given temperature are very meagre, and therefore a wide margin of safety is advisable.

The following figures can be taken as showing the main relationship between temperature and the rate of destruction of bacteria according to present ideas:—

100° C. Boiling at atmospheric pressure—Vegetative forms and the less resistant spores killed within 30 minutes.

115° C. Moist Heat—Vegetative forms and spores killed within 30 minutes.

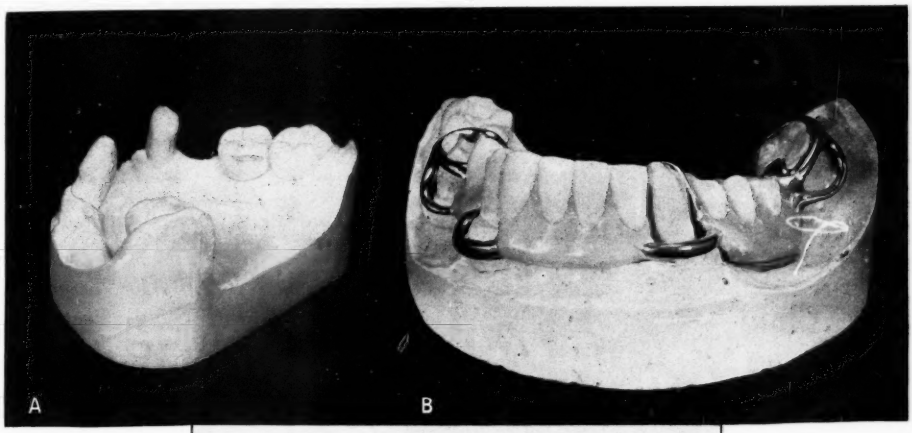
160° C. Dry Heat—Vegetative forms and spores killed within 1 hour.

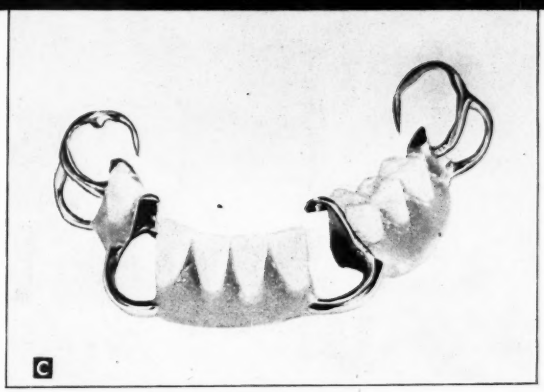
Considering the practical sterilization of hypodermic syringes, we find three methods in general use: (1) Boiling at atmospheric pressure; (2) Autoclaving; and (3) Hot air.

**1. Boiling at Atmospheric Pressure.**—This is the oldest method, and can be considered satisfactory for most purposes, provided the boiling is sufficiently prolonged. For the reasons given under the heading "Disappearance of Calibration Marks", only distilled water should be used, but if this is not available, previously boiled *soft* water should be used in order to reduce the precipitation of the solids present in ordinary water upon the component parts of the syringe, as these solids are quite sufficient to spoil the smooth

# PARTIAL DENTURE CONSTRUCTION PROBLEMS

## CHART No. 1




The difficulty presented by this case was lingual inclination of the natural teeth, as will be observed in A. Insertion of a normally constructed denture would have been impossible without mutilation of the denture, creating food traps in the $\overline{3|3}$ area, and, without a doubt, discomfort to the patient.

The model was surveyed and a denture designed having the three saddles connected by labial bars, back-action clasps using the lingual undercut of $\overline{6|7}$ for retention, and rests were placed on $\overline{63|37}$. The "frame" was cast in white gold, and the denture finished in the normal way.

No difficulty was experienced in fitting the denture, and the case was completely satisfactory.

C. T. YOULES.

movement of a high-precision syringe. The use of previously boiled soft water means that the alkaline content of the water is very greatly reduced but even so it does not prevent a slight precipitation of solids on the component parts of the syringe. The use of distilled water, however, completely eliminates the alkaline content, and thus avoids the precipitation of solids. If a properly constructed sterilizer is not available, a pad consisting of several thicknesses of lint, gauze, or similar material should be arranged to cover the bottom of the vessel to prevent the syringe coming into direct contact with the heating surface.

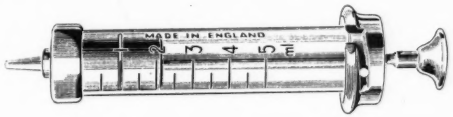



*Fig.* 1.—Howal Record type syringe.

*Fig.* 2.—Howal "Centimax" Half Record type syringe.

**2. Autoclaving.**—The apparatus used for sterilization by moist heat is known as an Autoclave, in which steam under pressure is the sterilizing agent. It is important to realize that in an autoclave the steam is under pressure merely to raise the temperature. It is the temperature and not the pressure that is the lethal agent. Autoclaves are usually fitted with a pressure gauge, and a gauge pressure of 25 lb./sq. in. is equivalent to 130° C., but these figures apply only to pure steam. If, however, the air in the autoclave is not completely removed, the gauge reading of the pressure within will not give a true indication of the temperature, for it should be remembered that steam is a gas and obeys the laws of gases. From the Law of Partial Pressures it follows that if only three-quarters of the air is removed and steam is then admitted until a gauge pressure of 20 lb. is shown, 5 lb. of this pressure will be due to the trapped air. Hence the actual temperature will correspond only to a steam pressure of 15 lb. (=121° C.), and not to the gauge pressure of 20 lb.

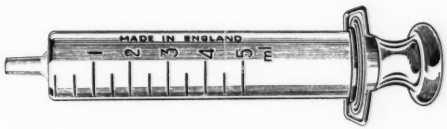



*Fig.* 3.—Howal "Centimax" All-glass type syringe.

At one time it was considered that a mixture of air and steam was a less efficient sterilizing agent than steam alone, but it has now been shown that they are equally efficient at the same temperature, so that providing a thermometer is fitted, it is not necessary to evacuate all the air from the autoclave.

**3. Hot Air.**—The hot air method of sterilization is best carried out in an oven specially designed for the work. A thermostat is essential, and the recorded temperature should be clearly visible to the operator.

*Fig.* 4.—Howal " Lüer-Lock " type syringe.

### TEMPERATURES AT WHICH DIFFERENT TYPES OF SYRINGES CAN BE STERILIZED

**Record Type** (*Fig.* 1).—The normal type of Record syringe should not be sterilized at temperatures much in excess of 100° C., otherwise the alloy used for affixing the mounts is likely to become molten.

**Half Record Type** (*Fig.* 2).—Some makes of Half Record syringes cannot be sterilized at temperatures above 120° C. as at that temperature the alloy used for affixing the bottom mount becomes molten. The best quality syringes, however, have the bottom mount affixed with a special alloy with a melting point in excess of 200° C., and they can,

therefore, be sterilized in safety at that temperature.

**All-glass and Luer-Lock Types** (*Figs.* 3, 4).—The best quality All-glass and Lüer-Lock syringes can safely be sterilized at temperatures up to 300° C. if desired, but inferior syringes made from cheap glass are extremely prone to thermal breakage during sterilization.

## THE CARE OF HYPODERMIC SYRINGES

**The Cleaning of Syringes.**—Sterilization *does not clean*, and therefore hypodermic syringes should be thoroughly cleaned before sterilization. After use with aqueous solutions, flushing out with luke-warm water and wiping with a wad of cotton-wool is usually sufficient, but after use with solutions of an oily nature, the inside of the barrel and the piston should first be flushed out with luke-warm water, and then wiped out with cotton-wool moistened with a highly volatile spirit such as ether or carbon tetrachloride. This mechanical cleaning is essential if the smooth movement of a high-class syringe is to be retained.

New syringes, although cleaned and tested by the manufacturers, should nevertheless be carefully cleaned and sterilized before use.

After sterilization, the syringe can be stored either in a sealed sterile envelope or by immersion in surgical spirit. If the latter method is adopted, then, before use, the syringe should be given a violent shake or two with the nozzle downwards to discharge the liquid trapped in the needle mount.

**Removal of Record Pistons during Sterilization.**—The metal piston of a Record type syringe must always be removed prior to sterilization, otherwise the greater expansion of the metal will split the barrel. If more than one syringe is being sterilized at the same time, each piston should be attached to its respective barrel, since generally they are not interchangeable. The small spring clips sold for holding tools on a work bench are ideal for this purpose. Alternatively, a rubber band may be used.

If it is proposed to sterilize a Half Record, All-glass, or Lüer-Lock type of the syringe 'in one piece', i.e., with the plunger inside the barrel using hot-air sterilization, both plunger and barrel should first of all be placed separately in a hot-air drier so as to remove entirely all traces of moisture before reassembling the syringe, prior to placing it in the sterilizer. If this precaution is not taken, there is a possibility that any foreign deposit in the moisture present between the plunger and the wall of the barrel will, when subjected to high temperature, cause the plunger to adhere firmly to the barrel, and make it difficult subsequently to remove the plunger without damaging the syringe.

It should be remembered that the presence of moisture materially assists sterilization, and it is therefore often advisable to remove the plunger to allow free access to all parts.

Syringes should be allowed to heat up and cool gradually. Never attempt to insert the metal piston of a Record syringe into the barrel until all parts are quite cool.

**Blacking Up.**—This is the term applied to the formation of black deposit upon the walls of a Record type syringe if the piston is moved up and down a considerable number of times when the syringe is dry. A hypodermic syringe represents one of the highest forms of precision engineering, and the clearance between the piston and the barrel of a good quality syringe is negligible, with the result that the movement of the piston when dry causes considerable friction. However finely ground the bore of the syringe may be, examination under a microscope will show that it has a slightly abrasive surface, hence the movement of the piston over this surface produces a mixture of very fine glass and metal particles, and since it is for all practical purposes impossible to keep anything entirely grease-free, this glass and metal mixture combines with the grease to form a black deposit. This deposit can be easily removed by wiping the inside of the barrel and the piston with a highly volatile spirit, but the real answer is not to allow it to occur, because it is only a sign of excessive wear taking place on the component parts. Under service conditions, of course, the injection solution acts as a lubricant and reduces the abrasive action to

negligible proportions. Although it is not obvious by the formation of black deposits, this abrasive action also takes place between the component parts of an all-glass syringe and, therefore, it should be taken as an axiom that no syringe should be moved up and down in a dry condition more than is absolutely necessary.

**Sticking Pistons.**—As has been already indicated, the clearance between the piston and barrel is negligible, and consequently if the syringe is stored for any considerable period of time with the slightest trace of moisture between the piston and barrel, it will be found when this moisture has dried that it is impossible to move the piston. With the Record type syringe, special piston extractors are available which, in the majority of cases, will succeed in freeing the piston, and then if the barrel and the piston are thoroughly cleaned, the syringe will be found to function normally. With the All-glass and Half Record types things are not so easy, for it is not practicable to apply considerable mechanical force, and the only thing that can be done is to boil the syringe in an aqueous solution containing 25 per cent glycerin; this, however, is not usually very successful, and so the greatest possible care should be taken to see that the component parts are absolutely clean and dry before an assembled syringe is stored for any length of time.

**Pressure.**—This is a very difficult thing to assess accurately. Many attempts have been made to devise mechanical means (the British Standards Specification for Hypodermic Syringes includes a suggested system), but it is doubtful if any could be considered entirely satisfactory.

One of the difficulties is that the amount of leakage varies greatly with the relative positions of the axes of the piston and barrel. For example, when the axes are parallel and the piston is displaced laterally to make line contact with the barrel, the leakage under similar conditions of time and pressure is two-and-a-half times as great as when the piston and barrel are co-axial; thus it is necessary to control the conditions of test very closely before comparisons can be made. Under the conditions of test suggested by the British Standards Institution, the permissible leakage is approximately $7\frac{1}{2}$ per cent of the total nominal capacity of the syringe in 30 seconds under a pressure of 42·7 lb. per square inch.

People often attempt to assess the pressure of a hypodermic syringe by closing the needle mount with the finger and drawing back the piston, thus feeling the gravitational pull. It is a most dangerous method, because should the piston knob slip from the fingers, in the majority of cases the piston will hit the bottom of the syringe hard enough to break it. To try the pressure of a syringe, it is much better first to withdraw the piston well up the barrel and then to close the needle mount with the finger and press down upon the piston, thus feeling the compressional force.

**Sticky Movement.**—In a good-quality syringe, a sticky movement of the piston inside the barrel can almost invariably be traced to the presence of minute quantities of dirt, and thoroughly wiping out the barrel and cleaning the piston in a volatile spirit, as indicated previously, will overcome this trouble.

**Disappearance of Calibration Marks.**—It is safe to say that nearly all complaints of disappearance of the calibration marks can be traced to attack by an alkali.

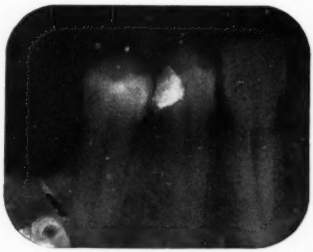
Merrett, writing of glass in the seventeenth century, said: "It looseth nor weight nor substance with the longest and the most frequent use." We now know, unfortunately, that this is not true, and that glass is quite definitely susceptible to attack. To all intents and purposes it is impervious to acids with the exception of hydrofluoric acid, and, to a much lesser degree, hydrochloric acid, but it is very susceptible to attack by alkalis, and, since the majority of disinfectants fall within this group, it follows that on no account should they or sodium carbonate be added to the water used in the sterilizer, or to the media used for storage after sterilization. The average sample of tap water is sufficiently alkaline to cause a slight loss of weight after very prolonged boiling, and therefore, as previously stated, nothing but distilled water should be used for the sterilization of hypodermic syringes.

Since the ceramic used for the calibrations is softer than the base glass, the first manifestation of alkali attack is the disappearance of the calibration marks. It should be realized, however, that although it may not be so apparent by the time the ceramic has been eroded, the barrel too has suffered sufficient damage to destroy its efficiency.

Considerable care must always be taken after de-scaling sterilizers. The majority of de-scaling compounds are very highly alkaline, and if the sterilizer is not thoroughly cleared out after de-scaling, so that no trace of the compound remains, then the calibration marks will be attacked by the alkaline content still remaining in the sterilizer.

# What was your Opinion?

A



B

The filling in $\overline{|4}$ is a zinc-oxide–eugenol. The white markings between $\overline{|4}$ and $\overline{|5}$ in A were due to faulty processing. Another X-ray (B) in the same film pack was free from any markings in this position.

The makers of the X-ray film were consulted, and we quote their reply:

"We have examined the film with the white markings rather carefully and are of the opinion that the trouble has been caused by hypo contamination before development. Contamination of this kind would inevitably cause this type of trouble. Even a touch of the dry film on a hanger or clip which was contaminated by hypo could produce this type of marking.

*Moral:* The necessity for meticulous care in the processing of a negative is amply illustrated. A marking such as that on A might easily appear in such a position as to be interpreted in a number of ways and treatment be begun on the assumption that the film was an accurate reproduction of the dental condition.

We give below two theories which were among those submitted :—

1. "Zinc oxide has been forced down the periodontal membrane either during the operation or by masticatory trauma. The particles of zinc oxide have been carried down, probably via the lymphatics, and deposited in the alveolar bone.

"These particles will in time be removed by phagocytes."

2. "I should imagine the particles are loose pieces of zinc oxide."

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Readers will, no doubt, have realized that these X-rays have been inadvertently depicted in reverse.

# LETTERS TO THE EDITOR

*From the Chairman of the Dental Board of the United Kingdom.*

September 12th, 1950.

Dear Seear,

Thank you very much for letting me see a copy of your journal. I congratulate you on the form of it and on the subject-matter, and I am quite sure that if you can maintain this standard your journal will have a great future.

It is refreshing in these days to find scientific and professional journals which are not concerned with politics and I beg leave to wish you every success.

Yours sincerely,

E. WILFRED FISH.

34, *Weymouth Street*, *W.*1.

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September 7th, 1950.

*To the Editor.*

Dear Sir,

May I send you heartiest congratulations on your first number. I have picked up more hints from reading this number than I do from all the other journals I read.

The main success of this number is that it is practical and of everyday use to us in general practice.

Yours sincerely,

I. A. M. MITCHELL.

6 *Chiswick Place*, *Eastbourne.*

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September 8th, 1950.

*To the Editor.*

Dear Sir,

May I say that I hope you maintain the extremely high standard set by your first issue which I enjoyed immensely.

Yours faithfully,

B. T. POSNER.

110B, *Bury Old Road*, *Manchester*, 8.

[This is an occasion when it would seem unnecessary for us to dissociate ourselves from the views expressed !—*Editor.*]

## *SOCIETY NOTES*

### BRITISH SOCIETY OF PERIODONTOLOGY

**Programme—1950–1951**

Monday, Oct. 9, 1950, at 5 p.m. Institute of Dental Surgery, Eastman Dental Hospital, Gray's Inn Road, W.C.1.

Presidential Address by Mr. Cyril de Vere Green, F.D.S.R.C.S.

Monday, Dec. 11, 1950, at 5.15 p.m. London Hospital Medical College, Turner Street, E.1.

"The Toothbrush", by Mr. Colin Davis, L.D.S.R.C.S. Casual Communication by Prof. A. E. W. Miles, F.D.S.R.C.S., M.R.C.S., L.R.C.P.

Monday, Feb. 12, 1951, at 3.30 p.m. The Dental Hospital of Manchester, Bridge Street, Manchester, 15.

"Local Causes of Periodontal Disease", by Mr. A. F. Stammers, M.D.S. Casual Communication by Mr. J. Harrington, B.D.S.

Monday, March 19, 1951, at 5 p.m. King's College Dental School, Denmark Hill, S.E.5.

"The Periodontal Splint", by Dr. E. Wilfred Fish, C.B.E., M.D., F.D.S. R.C.S. Casual Communication by Mr. P. Trotter, B.D.S., H.D.D.

Monday, April 9, 1951, at 2 p.m. Institute of Dental Surgery, Eastman Dental Hospital, Gray's Inn Road, W.C.1.

Clinical Meeting. Annual General Meeting. Annual Dinner.

All meetings will be preceded by tea (1s.).

### CONTINENTAL DENTAL SOCIETY

A MEETING will be held at the Eastman Clinic, Gray's Inn Road, London, W.C., on Saturday Nov. 25. Particulars obtainable from the Hon. Secretary, Mr. F. G. Salomon, 5, Bladud Buildings, Bath. Members of the profession are cordially invited.

# ABSTRACTS
## *from Other Journals*

### General Anæsthesia for Dental Surgery in Increased Risk Cases

Cases of increased risk requiring dental surgery who are unsuited to local or regional anæsthesia by reason of oral sepsis, of widespread caries, or of temperament, as well as those cases suffering from bronchiectasis, myocarditis, nephritis, disseminated sclerosis, or antenatal cases who are late in seeking oral hygiene, will greatly benefit by this type of general anæsthesia.

After the usual premedication of morphine and atropine administered an hour before the operation, the patient is anæsthetized on the theatre table by giving Kemithal intravenously followed by a solution of paraldehyde and inhalation of nitrous oxide with oxygen.

To maintain the airway an oiled Magill endotracheal catheter is introduced through the nose into the pharynx. The upper oropharynx and fauces are thoroughly packed with folded moistened gauze, taking care that no part of the bevelled end of the tube becomes obstructed. Perfect anæsthesia results for at least ten minutes.

Recovery is rapid, though a quiet sleep ensues from which the patient is easily roused. Within half an hour the patient is usually fully awake.

When the anæsthesia is expected to continue longer than ten minutes, endotracheal anæsthesia should be employed.—GIFFORD, L. A. (1950), *Brit. J. Anæsth.*, **22**, No. 3, July.

### Diagnosis and Surgery in the Maxillary Sinus Area

That portion of the maxilla bordering upon the antrum of Highmore is one of divided responsibility, between the otorhinolaryngologist and the dental surgeon, as each recognizes and discharges his full share of that responsibility in a spirit of understanding and co-operation. The shape of the maxillary sinus is such that with its countless variations unusual radiographic appearances result, which can be very misleading, and the dental surgeon should be able to diagnose these. When a dental radiograph is made in this area, the tube must necessarily be directed downwards at varying angles, for confirming the diagnosis. If the cystic-appearing area with its dense wall meets the nasal floor to form a Y as the two dense bony lines blend together, we can be reasonably sure we are dealing with an antrum and not a cyst. Use of a magnifying glass is strongly recommended to detect if the periodontal membrane has been disrupted in its continuity. The use of lateral-jaw and anteroposterior films are absolutely necessary for thorough diagnosis. Transillumination technique is a real aid in questionable diagnosis. When in grave doubt explore the suspected area with a sterile trocar or heavy aspirating needle. It is a wise policy never to carry out any dental extraction or surgery in the proximity of the antral floor without having a dental radiograph of that region. Size, position, and shape of roots, condition of bone around the roots, and relation of roots to antrum, are but a few points which should be noted from such a radiograph.

To avoid fracturing the tuberosity in a case of a lone tooth in that region, it is better to remove it surgically rather than by forceps, as when a tuberosity is lost a great prosthetic problem results, because the tuberosity is one of the main retentive factors in denture construction.

Sometimes in extracting a root in the antral region, a small puncture of the antral lining occurs after the root has left its socket. In such a case the patient should be prohibited from blowing the nose, rinsing the mouth, sneezing, and sucking actions for at least a week, and the nose should be sprayed on the affected side four times daily during that first week, using ephedrine with merthiolate. If the lining membrane is destroyed the alveolar process should be trimmed on either side, and the flaps brought together with sutures. Before closure, it is advisable to dust sulphathiazole

and penicillin powder into the wound. If a root has been pushed into the antrum, it is better not to attempt its removal through the original point of entrance, as it invites the formation of a fistula, but to close the opening in the alveolus and subsequently to make an incision in the canine fossa, cutting a window in the anterior lateral wall of the antrum and removing it under direct vision and accessibility. When an antra-oral fistula exists, refer the case at once to an ear, nose, and throat surgeon.

In conclusion, let us remember that the maxillary sinus, when involved through dental sources, is within the realm of oral surgery. It is much more dignified, honest, and to the point, when referring patients, to explain simply that your interest in their comfort and welfare prompts you to refer them to one especially trained and equipped for that particular job.—WAKEFIELD, BERNARD G. (1950), *Oral Surg., oral Med., oral Path.*, **3**, No. 6, June.

### Soft Tissue Lesions of the Mouth

The importance of careful and thorough examination into any soft-tissue lesion of the mouth is stressed. The mouth requires just as intensive an examination as any other part of the body, and the diagnosis should be made only after everything possible has been brought to its aid. The author illustrates these points by reference to various typical lesions of the mouth and shows that many of them have a purely systemic origin. Treatment will depend upon the diagnosis.

Although gingivitis in a great many cases is caused by local aetiological factors, a number of cases are associated with systemic conditions which give rise to similar appearing lesions. Pregnancy, nutritional deficiencies, and reaction to chemicals and metals are cited. In more recent years mouth lesions have arisen from the use of dilantin sodium and penicillin, and from allergic reactions to sera and other agents. Another group of diseases gives rise to lesions which are local manifestations of the particular disease, such as diabetes, blood dyscrasias, endocrinopathies, dermatologic lesions, exanthematous lesions, and specific infections (e.g., tuberculosis, syphilis). All of these diseases, and their relation to the oral lesion, are discussed with illustrations.

An interesting case is cited of a patient who was treated without success for one and a half years for desquamative gingivitis, which, after investigation, was found to be a case of pemphigus. This case brings out the importance of reviewing any lesions which do not respond readily to treatment. Cases are reported where the diagnosis was made only after a microscopical examination.—KALETSKY, THEODORE (1950), *Oral Surg., oral Med., oral Path.*, **3**, 240.

### The Toxicity of Fluorides in Relation to Their Use in Dentistry

The toxicology of fluorides is reviewed in aspects related to dental health. This is important when it is realized that the list of fluorine products that are now used is surprisingly large—for fluoridization of water, topical application for caries control, pastes to desensitize dentine, toothpastes and powders, mouth-washes, in vitamin tablets and chewing gum. The authors discuss acute and chronic poisoning and investigate the effects of doses used in dental treatment. Their conclusions show that there is no likelihood of chronic fluorosis arising from the use of fluorides in the treatment of dental diseases. However, the preparations must be used with care. A two per cent solution of sodium fluoride for topical application is perfectly safe, but it should never be prescribed for home use. Concentrated preparations of sodium fluoride have been shown to produce pulpal reactions when used on freshly cut dentine for desensitization and should not be used. Fluorides should never be sealed in cavities: they will cause intense pain followed by pulpal abscess.

"The Professional man has no right to be other than a continuous student."
—G. V. BLACK.

The report brings out the fact that fluorine preparations are drugs and must be used carefully and within the proper prescribed limits. The hazards are there, and the practitioner should be conversant with them, both for himself and his patients.—Cox, Gerald J., and Hodge, Harold C. (1950), *J. Amer. dent. Ass.*, **40**, 441.

### The Use of Aureomycin in Oral Infections

This is a preliminary report on the use of aureomycin in oral infections. Over 100 cases were treated showing a variety of oral infections. Aureomycin is one of the most recently discovered chemotherapeutic agents used in the treatment of infective diseases. This is the first report on the use of this drug in dental infections.

Their studies have led the authors to believe that aureomycin is not only beneficial in the treatment of oral infections but that the results were superior to other antibiotics. It is effective in cases of necrotic gingivitis and many other forms of gingivitis, in pericoronitis, acute abscesses both alveolar and periodontal, and for post-operative complications. It was also found to be effective in cases of penicillin resistance and penicillin allergy.

Aureomycin is a drug that has to be used with care and circumspection, but this study shows that we are able to add yet another most useful agent to our armamentarium.—Stewart, George Morgan, and Roth, Lester Hugh (1950), *J. Amer. dent. Ass.*, **40**, 563.

### Age Determination on Teeth

The aim of this investigation, carried out in the Department of Dental Histopathology at Malmo, Sweden, was to work out a method of age determination of teeth for use in forensic medicine. The age of a person is obviously helpful in information required by the police, and the teeth are often the only means of identification.

The usual method is by assessing general changes in the tooth, but much of this leads to some amount of guesswork and usually a too high estimation of the age. Errors of from 2 to 20 years have been found using this method.

The age changes noted in the new method were: attrition, periodontosis, secondary dentine, cementum apposition, root resorption, transparency of the root, and the closing of the root orifice. These changes were examined both macroscopically and microscopically, using ground sections. The factors were given a points valuation, according to the degree of change, from 0 to 3 and added together. The final points value for the tooth having been calculated, the age is determined by reference to a graph worked out by the authors from standard research on teeth of known ages. It was found that by this method the estimated age was accurate to a high degree, the error estimation being $\pm$ 3·6 years.

The advantages of this method are that a number of factors are taken into consideration and that a large occasional change within a single factor does not appear to alter the final age estimation.—Gustafson, Gosta (1950), *J. Amer. dent. Ass.*, **41**, 45.

## BOOK NOTICES

**THE LAW AND ETHICS OF DENTAL PRACTICE.** By R. W. Durand, M.R.C.S., L.R.C.P., formerly Secretary of the Medical Protection Society; and D. Morgan, L.D.S. (Leeds), formerly Deputy Dental Secretary of the British Dental Association. With a Foreword by Professor R. V. Bradlaw. $5\frac{1}{2} \times 8\frac{1}{2}$ in. Pp. 98 + viii. 1950. London: Hodder & Stoughton Medical Publications. 7s. 6d.

**DENTAL ANATOMY AND PHYSIOLOGY FOR STUDENTS.** By James Aitchison, B.Sc., H.D.D., D.D.O., L.D.S., Director of Dental Education, University of Glasgow; Director of Glasgow Dental Hospital; etc. Second edition. $5\frac{1}{2} \times 8\frac{1}{2}$ in. Pp. 418, with 159 illustrations. 1950. London: Staples Press Ltd. 25s.